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Monitoring snow cover and its effect on runoff regime in the Jizera Mountains

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Abstract

The Jizera Mountains in the northern Bohemia are known by its rich snow cover. Winter precipitation represents usually a half of the precipitation in the hydrological year. Gradual snow accumulation and melt depends on the course of the particular winter period, the topography of the catchments and the type of vegetation. During winter the snow depth, and especially the snow water equivalent, are affected by the changing character of the falling precipitation, air and soil temperatures and the wind. More rapid snowmelt occurs more on the slopes without forest oriented to the South, while a gradual snowmelt occurs on the locations turned to the North and in forest. Melting snow recharges groundwater and affects water quality in an important way. In case of extreme situation the snowmelt monitoring is important from the point of view of flood protection of communities and property. Therefore the immediate information on the amount of water in snow is necessary. The way to get this information is the continuous monitoring of the snow depth and snow water equivalent. In the Jizera Mountains a regular monitoring of snow cover has been going on since the end of the 19th century. In the 80s of the last century the Jizera Mountains were affected by the increased fallout of pollutants in the air. There followed a gradual dieback of the forest cover and cutting down the upper part of the ridges. In order to get data for the quantification of runoff regime changes in the changing natural environment, the Czech Hydrometeorological Institute (CHMI) founded in the upper part of the Mountains several experimental catchments. One of the activities of the employees of the experimental basis is the regular measurement of snow cover at selected sites from 1982 up to now. At the same time snow cover is being observed using snow pillows, where its mass is monitored with the help of pressure sensors. In order to improve the reliability of the continuous measurement of the snow water equivalent the LDSMS (Libor Danes Snow Measurement System) which uses weighing sensors has been developed. The system contains a novel device precluding the snowbridging (protected by a utility model). Data from manual and automatic measurements are transmitted to the central forecasting service of CHMI in Prague – Komorany (CPP) and to regional forecasting branches (RPP), where they are one of the inputs of the hydrological forecasting models.
The contribution deals with the results of the manual snow measurement during the dieback of forest and now, in comparison with the automatic snow measurement in the experimental catchments of CHMI Uhlirska, Jezdecka and with the effect of snowmelt on the water level in the streams.